

Why Can't Anything Be Done?

Measuring Physical Readiness of Women for Military Occupations

***Paper presented at the 2011 International Biennial Conference of
the Inter-University Seminar on Armed Forces and Society***

***Chicago, Illinois
21-23 October 2011***

***Dr. William J. Gregor
Professor of Social Sciences
School of Advanced Military Studies
US Army Command and General Staff College
Fort Leavenworth, Kansas 66027***

The opinions expressed in this paper are those of Dr. William J. Gregor and are not the views of the Department of Defense, the Department of the Army, the U.S. Army Command and General Staff College, or the School of Advanced Military Studies.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE OCT 2011		2. REPORT TYPE		3. DATES COVERED 00-00-2011 to 00-00-2011	
4. TITLE AND SUBTITLE Why Can't Anything Be Done? Measuring Physical Readiness of Women for Military Occupations				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) US Army Command and General Staff College,School of Advanced Military Studies,Fort Leavenworth,KS,66027				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 43	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

TABLE OF CONTENTS

TABLE OF CONTENTS	2
INTRODUCTION	3
A HOST OF REVIEWS	4
USE OF WOMEN IN THE MILITARY 1982.....	5
THE ASSIGNMENT OF WOMEN IN THE MILITARY 1992.....	6
KASSEBAUM-BAKER AND CONGRESS 1997-1998.....	8
THE ONLY PERFORMANCE STANDARD	10
COMBAT REQUIREMENTS	13
MEASURING PHYSICAL CAPACITY	14
ARMY ROTC APFT PERFORMANCE	17
THE PERFORMANCE GAP	21
MILITARY PERFORMANCE	28
REMEMBERING MILITARY READINESS	28
BIBLIOGRAPHY	32
APPENDIX A: Trends in ROTC APFT Performance 1992-2000	35
APPENDIX B: Discussion of Impact of New 1998 APFT Standards on Cadet APFT Scores (Presented to Cadet Command June 1998).....	37

INTRODUCTION

“After seven years of the all-volunteer armed forces and almost as many years of debate over the role of women in the military, one might ask why anyone would seek to add a single additional syllable to this deeply emotional, frequently acrimonious discussion.” That sentence opened an article entitled “Women, Combat, and the Draft”¹ published in a book entitled *Defense Manpower Planning: Issues for the 1980’s*. The title of the article reflected the then important legal and political argument of whether in reestablishing Selective Service Registration Congress was required to register women as well as men. However, why is the question just as apt today, some 30 years later? Why after some 30 years are the Congress, the Army, and the public still wrestling with the role of women in the military? Just as was the case in 1980, it is unlikely that any new article is going to move the front lines in this policy struggle. Nevertheless, at the risk of becoming yet another casualty in the war of words, it seems useful to revisit the questions posed in “Women, Combat and the Draft,” even if the product is only a litany of what we have failed to learn. Fortunately, a review of the government’s efforts to develop appropriate policy for the assignment of women in the armed forces is not as drab as that, though it is depressing. The story is depressing because the episodic policy reviews have focused more on the social dimensions of the force than on the functional requirements and, thus, the reviews have not advanced the Services’ understanding of how best to train and employ the force. The recently published report of the Military Leadership Diversity Commission, *From Representation to Inclusion: Diversity Leadership for the 21st-Century Military* is yet one more example of social engineering to make the force look right, but will it work right? Hence, the purpose of this article is once again to illuminate the questions that ought to have answers and to ask why can’t anything be done?

¹ William J. Gregor, “Women, Combat and the Draft: Placing Details in Context,” in William J. Taylor, Jr. and Eric T. Olson, ed., *Defense Manpower Planning: Issues for the 1980’s* (Elmsford, NY: Pergamon Press, Inc., 1981), 34.

A HOST OF REVIEWS

When “Women, Combat, and the Draft” was written, there was little evidence upon which to base policy for the assignment of women in the armed forces. The 1977 Department of Defense background study, *The Use of Women in the Military*, set as its goal to avoid emotionalism and to report what information was available and where DoD could expect to be in five years.² However, the study addressed only military manpower requirements and projections for expanding the percentage of women in the military. The issue of individual performance was not addressed. Curiously, in retrospect, *the Use of Women in the Military* established what have become the unchanging boundary of the policy debate. Although the study opened with the usual piety, “To put this study in context, one must remember that the overriding issue is maintaining the combat effectiveness of the armed forces.”³ It immediately stated the reasons for increasing the role of women in the military: the movement in society to provide equal economic opportunity for women and to meet the manpower needs of the all-volunteer force in the face of a declining youth population. The record now shows that the social concern for equality has dominated policy-making to such extent that the collection and evaluation of performance data, individual and collective, has been either overlooked or slighted. The policy reviews that have occurred have been occasioned largely by serious social problems in the training base and field or by flamboyant assessments of military operations. However, in no instance has performance data ever trumped the social concern for progress toward equality. That is not to say that the policy reviews did not invite testimony and collect performance data, only that the issues of performance, especially in the land forces, were discounted when decisions were made. However, in contrast to many of the previous reviews, the Military Leadership Diversity Commission

² Department of Defense, Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics), *The Use of Women in the Military*, 2nd Ed. (Washington, D.C., September 1978), 1.

³ Ibid.

limited its attention entirely to social concerns, even noting that military eligibility requirements present a structural barrier to service.⁴ Thus, the diversity commission findings are devoted totally to achieving the commission's ideal representation of women and minorities in the military, performance requirements notwithstanding. They want the military to look right, whatever that means?

USE OF WOMEN IN THE MILITARY 1982

A 1976 Government Accounting Office Report, "Job Opportunities for Women in the Military: Progress and Problems," recommended that each Service develop physical standards for its jobs and standards for measuring strength, stamina, and other job requirements.⁵ Two years later an Army study observed, "The current lack of established performance standards, unvalidated critical tasks, and the absence of a system for measuring potential against standards precludes reliable determination of the physical capabilities soldiers of either sex must possess to do their job."⁶ Nevertheless, the Army did not address the matter again until 1982. Unlike the 1977 DoD background study, the 1982 *Women in the Army Policy Review* guided its work by two different principles. First, the review stated that the personnel policies must support fully combat readiness, and second, those policies should maximize the soldier's contribution to the Army's mission.⁷ The policy review recommended implementing a Military Enlistment Physical Strength Capacity Test (MEPSCAT) that would be used to match recruits to the physical demands of their jobs.⁸ The *Women in the Army Policy Review* reported that only 8 per cent of women were

⁴ Military Leadership Diversity Commission, *FROM REPRESENTATION TO INCLUSION: Diversity Leadership for the 21st Century* (Arlington, VA: March 15, 2011), 47.

⁵ Office of the Deputy Chief of Staff for Personnel, *Women in the Army Policy Review* (Washington, D.C., 12 November 1982), 2.

⁶ Department of the Army, *Evaluation of Women in the Army* (Washington, D.C., March 1978), 1-18.

⁷ *Women in the Army Policy Review*, 3.

⁸ *Ibid.*, 9.

capable of performing jobs in the heavy work category; i.e., frequent lifting of over 50 pounds and occasionally lifting of 100 pounds.⁹ Nevertheless, the study observed that 42 per cent of all Army women were assigned to a heavy work MOS. In other words, many of the women in 1982 were assigned to military specialties in which they could not physically perform the required work. Implementing MEPSCAT would have aligned women with appropriate specialties but it would have excluded women from a large number of specialties. The recommendations were not implemented. Setting physical performance standards based on military job requirements interfered with the expansion of the role of women in the military, so the idea was shelved.

THE ASSIGNMENT OF WOMEN IN THE MILITARY 1992

Success in the 1991 Gulf War spawned another review of the assignment of women in the military. The collective success of the military enterprise was seen as evidence that individual performance anywhere on the battlefield had also been superior. While this conclusion is logically insupportable, that did not deter a Democrat Congress intent on using the war outcome to justify increasing social equality. The Congress repealed most of the statutory restrictions on the assignment of women in the Navy, Marine Corps, and Air Force in December 1991. However, the expansion of the role of women was temporarily stalled by a call to appoint a Presidential Commission to investigate changes to policy on the assignment of women in the armed forces. The Commission's report, published November 15, 1992, finessed the intractable problem of female physical performance. The commissioners voted 12 to 0, with one abstention, to recommend that the Services retain gender-specific physical fitness tests to promote general wellness¹⁰ and they voted unanimously, 14-0, to recommend that the Services adopt gender-

⁹ Ibid., 2-16.

¹⁰ *The Presidential Commission on the Assignment of Women in the Armed Forces*, by GEN Robert T. Herres, Ret., Chairman (Washington, D.C., November 15, 1992), 5.

neutral muscular strength/endurance and cardiovascular standards for relevant specialties.¹¹ The commissioners split on entry-level training. By a vote of 8 to 6, with one abstention, the commission supported maintaining gender-specific training. These recommendations along with others such as the recommendation to continue excluding women from combat aircraft positions reflected that commission's somewhat conservative makeup, which showed itself by a slightly greater concern for individual physical performance. All of which was no matter because the report had no impact on Service assignment and training policies.

The Clinton Administration that took office in January 1993 and the new Democrat Congress easily dismissed the Presidential Commission's recommendations and quickly set about the task of revising the definition of direct combat and the related restrictions on the assignment of women. Congress facilitated the redefinition by removing the statutory exclusion of women from combat vessels. However, the 1994 Defense Authorization Act (P.L. 103-160, November 1993) did more than repeal 10 U.S.C. Section 6015.¹² The authorization bill included a provision requiring the Secretary of Defense to establish for any military occupational career field open to both men and women, common relevant performance standards, without differential standards or evaluation based on gender.¹³ For any military occupational specialty requiring muscular strength and endurance and cardiovascular capacity, the statute directed the Secretary to prescribe specific physical requirements on a gender-neutral basis. That never happened. On July 27, 1994, the Secretary of the Army, Mr. Togo West, proposed expanding the number of career fields open to women to 91.2 per cent of the career fields, 67.2 per cent of all Army positions.¹⁴ On July 29, 1994, the Secretary of Defense, Mr. William Perry, announced the opening of some 80,000

¹¹ Ibid., 13.

¹² *1994 Defense Authorization Act* (P.L. 103-160, November 1993), section 541.

¹³ Ibid., section 543.

¹⁴ Secretary of the Army, Mr. Togo West, Memorandum, "Increasing Opportunities for Women in the Army," (Washington, D.C., July 27, 1994), photocopied.

additional positions in all the Services to women. No effort was made to address the question of individual suitability and physical performance standards.

KASSEBAUM-BAKER AND CONGRESS 1997-1998

The next opportunity to review the issue of physical performance standards was occasioned by neither a military success nor a growing shortage of military manpower. Rather it was the result of investigations into incidents of sexual assault at Aberdeen Proving Ground and other training bases. On June 27, 1997, Secretary of Defense William S. Cohen announced the appointment of the Federal Advisory Committee on Gender-Integrated Training and Related Issues. Chaired by former Senator Nancy Kassebaum-Baker, the advisory committee was to assess the current training programs of the Army, Navy, Air Force and Marine Corps and to determine how best to train the gender-integrated, all-volunteer force. In December that year, much to Mr. Cohen's surprise and that of the Services, the Kassebaum-Baker commission recommended separating men and women in basic training and providing gender-specific training.¹⁵ The Congress responded quickly and created its own commission to investigate initial entry training, the Congressional Commission on Military Training and Gender-Related Issues. Therefore, what initially was an investigation into sexual misconduct expanded to address the manner in which military recruits were trained.

Although it was not a formal element of the commission's charter, the political purpose of the commission was to provide a way to avoid implementing the Kassebaum-Baker committee recommendations on gender-integrated training while endorsing the Services response to that committee's other recommendations. Most of the commission's recommendations were unanimous and endorsed the status quo. Only on the issue of gender-integration during Initial

¹⁵ REPORT OF THE FEDERAL ADVISORY COMMITTEE ON GENDER-INTEGRATED TRAINING AND RELATED ISSUES TO THE SECRETARY OF DEFENSE (Washington, D.C.: December 16, 1997).

Entry Training, IET, did the commissioner's split. Five commissioners, Dr. Charles Moskos, LtGen William M. Keys, Ret., Mr. Thomas Moore, and the Chairman, Anita Blair, did not concur on the recommendation to permit the Services to continue conducting basic training in accordance with current policy.¹⁶ Dr. Moskos abstained because he thought the wording of the recommendation implied there were no serious problems with IET. He noted that the trainers' comments indicated that there was something seriously flawed in gender-integrated training. In contrast, commissioners Blair, Moore, and Keys wrote, "that, not only is there evidence of serious problems in gender-integrated training, but there is also substantial evidence that gender-separate training produces superior results."¹⁷ They, however, felt frustrated in their efforts to obtain the data needed to assess the cause. They noted that during the work of the commission the Services indicated that their decisions on gender-integrated training were final and that they were not willing to change. Similarly, the Services were willing to provide information supporting their positions but less forthcoming with information adverse to their positions. These commissioners noted too that the Services provided only a few extremely limited comparative studies and most of the studies were of sociological or psychological issues.¹⁸ In summarizing their findings concerning gender-integrated training, they observed that the evidence needed to judge gender-integrated training was to a large extent missing. So much so, they found it necessary to task the Services to:

Assess, with respect to each service, the degree to which different standards have been established, or if not established are in fact being implemented, for males and females in basic training for matters such as physical fitness, physical performance (such as confidence and obstacle courses), military skills (such as marksmanship and hand-grenade qualifications), and nonphysical tasks required of individuals and, to the degree that differing standards are in fact being implemented, assess the effect of the use of those differing standards.

¹⁶ Congressional Commission on Military Training and Gender-Related Issues Final Report (Washington, DC, 1999), xlii.

¹⁷ Ibid., 191.

¹⁸ Ibid., 195

Despite the Services' position that the standards during IET were the same for men and women the commissioners were convinced that the trainers were informally making accommodations to ensure the training results met Service expectations.¹⁹ In effect, the dissenting commissioners were asking the Services to define the physical performance standards for occupational specialties open to men and women. Thirty-three years after *The Use of Women in the Military*, despite numerous commissions and federal statutory requirements, the military still has no body of objective evidence to demonstrate the effectiveness of their training programs. There are no objective measures to assess the impact of training in a gender-integrated versus a gender-separated environment or to assess whether women are prepared to serve in heavy physical occupations, much less the combat arms.

THE ONLY PERFORMANCE STANDARD

What physical performance evidence was available, the Services in general and the Army in particular have sought mightily to disparage. That data, of course, is the data collected on physical fitness tests. The Congressional Commission on Military Training and Gender-Related Issues made fitness tests a particular point in its findings, recommending the Services take steps to educate service members about the meaning of "physical fitness," and how it differs from job performance standards. The Commission observed that there was widespread misunderstanding about the purposes of the Services' physical fitness test. The tests are, in the words of the Commission, designed to measure physical health and well-being.²⁰ That may be the correct clinical interpretation of Service physical fitness testing, but it is certainly not how the tests are used and it is not consistent with the prodigious amount of Army research devoted to it. The

¹⁹ "It is obvious to any observer of basic training that there are differences in physical performance between men and women. De facto differences in performance (whether or not meeting standards) create the appearance of unequal, or unequally applied, standards. This suggests that standards or testing may be manipulated to permit lower-performing recruits to pass." Congressional Commission on Military Training and Gender-Related Issues Final Report, 198-199.

²⁰ Ibid., xxxiv.

opinions of Army soldiers and officers diverge greatly from the official position but it not from a wanting in education. Their views come from experience with the application of the test. An experience that from enlistment through separation tells them that the Army Physical Fitness Test, APFT, is a test of physical fitness and the fitness implied is “physically fit to perform military tasks.” The APFT does not correlate directly with actual military tasks because the push-up and the sit-up does not measure strength related to tasks. Aerobic capacity measured by the 2-mile run is directly related to physical performance. Additionally, the APFT is important because, if you cannot pass the APFT, your ability to perform your military job does not matter. You will not be promoted; you will not attend Army schools; you will soon be separated.

However, the experience of 10 years of war has made clear that training to APFT standards is insufficient to meet the physical requirements of combat. In November 2010, the Army announced it was preparing a rigorous physical readiness test that addresses functional fitness.²¹ The list of events in what is now being called the Army Physical Readiness Test (APRT) has not yet been finalized. Under consideration is the inclusion of pull-ups as a test element. Additionally, it was thought that aerobic fitness could be assessed using a 1.5-mile run, but commanders have argued for retaining the 2-mile run. According to MGEN Richard Longo, who is responsible for developing the test, “While 1.5 miles measures all we need to measure about your cardiovascular fitness, that other half mile measures the other piece of the heart – the piece that keeps you going at 10,000 feet with an 80-pound ruck.”²² Although the new test is supposed to be gender neutral, that term only means that men and women will perform the same events. Men and women will be assigned scores based upon separate scoring tables. Setting performance standards for women on the pull-up event is especially challenging.²³

²¹ Lance M. Bacon, “A new way to measure fitness,” *Army Times*, November 8, 2010, 16.

²² Lance M. Bacon, “Tough PT Changes,” *Army Times*, September 12, 2011, 17.

²³ *Ibid.*, 16.

Despite the Army's need to develop a better test of physical readiness, the Army Physical Fitness Test does tell us a great deal about the physical potential of Army men and women and it, along with other physical data such as height, weight, and body fat content, does define the physical training potential of the military population. It may not be a worthy surrogate for actual physical performance measurements, but until now, the Army has consistently, avoided developing and applying those standards, so, by default, the APFT score is the standard. What the APFT scores means and how the scores are used is a subject that will be addressed later in this paper. Here, the issue is the Services' insistence, especially the Army's insistence, that the APFT is solely a measure of wellness, not to be confused with job performance. The Services in general, and the Army in particular, do not screen for physical potential before enlistment and they do not match recruits to occupational specialties based upon the physical requirements of the MOS. The Army MEPSCAT, proposed in 1982, would have done that but it was not implemented. The Army opened many physically demanding occupational specialties to women in 1994; e.g., 12C Bridge Crew Member, without establishing gender-neutral physical standards and without establishing a system to screen women recruits for the physical ability to meet the physical requirements of those jobs. Thus, the only measure of a soldier's ability to meet the strength and cardiovascular endurance requirements for advancement from IET, basic training, to advanced individual training, AIT, in the chosen MOS is the APFT. Failure to achieve a 50 on each event of the APFT and an overall score of 150 blocks the recruit's progress from basic training to advanced individual training and, thus, is currently the only assessment of a recruit's strength and endurance needed to be further trained. Introduction of the APRT and up-coming Army Combat Readiness Test will provide a much better assessment. However, until that happens, the APFT is *de facto* the test and the only means by which to assess readiness.

COMBAT REQUIREMENTS

The war against terrorism, in Afghanistan and in Iraq, has reminded the Army of its long-standing mission, sustained land operations. Unlike the swift operations in Panama in 1989 and Iraq in 1991, that were, in effect, sprints the war against terrorism is a long distance event that tests the Army's and the soldier's endurance. Gone too are front lines and a secure rear. The combat support and combat service support units are in amongst the combat units and the combat. For example, the 507th Maintenance Company's losses in the fight at Nasiriyah prompted the Army Training and Doctrine Command and the combat arms centers to work toward revising the basic combat training that combat service and support soldiers receive to ensure more are better prepared for the next fight.²⁴ Nevertheless, the fact that combat service and support units are found among combat units in the operational environment does not mean that women can meet the requirements of service in the ground combat arms because the physical requirements of direct combat, strength and endurance, are greater now than in past wars. In Afghanistan, the common Army infantryman's fighting load is 62 pounds while the average approach march load is 95 pounds. The squad leader, platoon sergeant, even the company executive officer carry similar loads. While an automatic rifleman's fighting load is 79 pounds and the machine gunner carries 120 pounds of equipment and ammunition in his approach march load.²⁵ The average fighting load is 35% of average man's bodyweight but half the bodyweight of an average army women.

The increased weight of the combat load combined with the high altitude in Afghanistan has placed a premium on strength and aerobic capacity and presents a significant challenge to

²⁴ Matthew Cox, "Warrior Spirit: Infantry chief wants to better train support soldiers for the battlefield," *Army Times*, September 22, 2003, 12.

²⁵ U.S. Army Center for Army Lessons Learned, *The Modern Warrior's Combat Load* (December 12, 2003), 112. A historical comparison of combat loads is contained in Joseph Knapik and Kay Reynolds, *Load Carriage in Military Operations: A Review of Historical, Physiological, Biomechanical, and Medical Aspects* (Washington, DC: Borden Institute, 2010).

sustaining performance in continuous operations. FM 22-9 notes at the outset that soldier resources shrink in combat. The combat losses are from not only battle deaths, wounds, non-combat injuries and illness, but also from physical fatigue and sleep loss, which undermines vigilance, slows decision-making, and impairs judgment and general performance.²⁶ Naturally, improving the strength and aerobic capacity of the infantryman is an important element in maintaining performance. So is the ability of the leader to balance the burdens to sustain the capacity of the entire unit. Tasks and load must be distributed within the squad and platoon to prevent overburdening anyone soldier and to ensure the entire unit shares the burden.²⁷ Tasks too must be rotated within the squad and platoon. Soldiers are cross-trained to permit task rotation and to provide relief for persons in critical positions. The leader cannot permit any one soldier to bare a task to exhaustion because that soldier's absence at a critical moment will undermine the performance and jeopardize the survival of the entire squad or platoon. Thus, within direct combat units, soldiers must strive to be not only individually fit but also all soldiers must be equally fit to sustain performance in combat operations. Thus, assessing the suitability of women for assignments in direct combat units requires an assessment of that population's strength and aerobic fitness and the ability to sustain readiness by avoiding injury. As the evidence will show, the physical capacity of women is significantly less than that of men and even more difficult to sustain.

MEASURING PHYSICAL CAPACITY

CPT Joseph Knapik explained in 1989, the elements of fitness tested by the APFT are related to military tasks. CPT Knapik observed:

In a military environment, absolute muscular endurance is important. Typical loads handled by soldiers include artillery shells, sand bags, crates, and weapons.

²⁶ FM 22-9 *Soldier Performance in Continuous Operations* (Washington, DC: HQ Department of the Army, 1983), 1-1 and 1-2..

²⁷ FM 22-9, 2-14.

The weight of these loads stays the same regardless of the individual soldier's strength. Stronger soldiers have a greater capacity for the high intensity, short duration efforts required to lift and carry these loads. Thus, for military purposes it is possible to combine the concepts of muscular strength and endurance since they are highly related on an absolute basis.²⁸

Similarly, the ability to run rapidly is highly correlated with aerobic capacity. An individual with higher aerobic capacity is able to perform sub-maximal physical tasks at a higher rate or for a longer time than an individual with lower aerobic capacity. Therefore, combining muscular strength and endurance with aerobic capacity provides a useful means to assess an individual's ability to perform the tasks normally encountered in the Army. The Army APFT does this by measuring relative strength using the push-up and aerobic capacity using the 2-mile run.

Because the push-up measures strength relative to a soldier's own body weight and weight distribution, the event is not by itself a measure of absolute strength. However, the 2-mile run is a good measure of aerobic capacity and using a formula found in Army FM 21-20 *PHYSICAL FITNESS TRAINING* the run-times for men and women can be converted into a measurement of aerobic capacity, $VO_2\text{max}$, measured in milliliters of oxygen per kilogram of weight per minute. Because the push-up is relative to the individual's physical stature, it combined with the aerobic capacity determined by the 2-mile run will not reveal the strength capacity of a population of men and women. However, COL Margarete DiBenedetto noted in her article, "Experience with a Pre-Basic Company at Fort Jackson," that height and weight are significant factors in the ability to use available strength and she developed an index of individual strength with which to compare groups of men and women reporting for basic training.²⁹ Thus, the APFT push-up and 2-mile run results and individual height-weight data when combined provide a good basis with which to compare the physical strength and endurance of men and

²⁸ Joseph Knapik, "The Army Physical Fitness Test (APFT): A Review of the Literature," *MILITARY MEDICINE* 154 (June 1989): 328.

²⁹ Magarete DiBenedetto, "Experience with a Pre-Basic Company at Fort Jackson," *MILITARY MEDICINE* 154 (May 1989): 259-263.

women. The more physically difficult the military task the more relevant the correlation. In other words, the comparison means very little if the task involved is light but it is significant for very heavy tasks.

Another major factor in individual physical performance is body fat content. Aerobic capacity is generally related to body fat while strength is related to fat-free mass. The higher the body fat content the lower aerobic capacity. Inversely, strength is related to total lean mass. A fat free mass of about 50 kilograms, 112 pounds, is the minimum needed to achieve a lift performance of 100 lbs.³⁰ James Vogel in his article “Obesity and Its Relationship to Physical Fitness in the Military,” observed that that fact alone could be used to screen recruits for strength capacity at Military Entrance Processing Stations.³¹ That fact also can be used to compare the ability of men and women to perform the tasks of heavy and very heavy category military occupational specialties. In either case, women are at a significant disadvantage when it comes to performing military physical tasks because they have a significantly higher percentage of body fat and generally much lower total lean mass.

The article in *Military Medicine* reporting the results of the 1988 Active Army Physical Fitness Survey clearly stated the Army’s position on physical fitness and combat readiness. It stated, “Physical Fitness has always been linked to combat readiness.”³² The article went on to say that in 1981, a major Department of Defense study found that the military services could neither accurately measure the fitness of their members nor provide appropriate fitness programs for its occupational specialties.³³ In response, the Secretary of the Army designated 1982 as the Year of Physical Fitness; the Army surgeon general created a task force on physical fitness; and

³⁰ James A. Vogel, “Obesity and Its Relationship to Physical Fitness in the Military,” *Armed Forces and Society* 18 (Summer 1992): 506.

³¹ Vogel, 507.

³² John S. O’Conner, Michael S. Bahrke, and Robert G. Tetu. “1988 Active Army Physical Fitness Survey.” *MILITARY MEDICINE* 155 (December 1990), 579.

³³ *Ibid.*

the Army Physical Fitness Research Institute and the US Army Physical Fitness School were created. All those efforts were intended to improve the soldier's physical fitness, thereby increasing his ability to succeed on the modern battlefield. Army fitness research cited in this paper is the direct consequence of the Army's concern for establishing the link between its fitness program and physical combat readiness. It is curious, given all the resources the Army has devoted to research and to development of the APFT standards that the Army now declares that the interest in the APFT was solely in wellness. That research has established the relevance of the APFT to military performance and its relationship to Army fitness standards. What the Army has failed to do is identify the physical performance standards for its military occupational specialties.

ARMY ROTC APFT PERFORMANCE

Male and female cadets participate in a summer training event usually a school year prior to commissioning. The training camp was previously called the Army ROTC Advance Camp but is now labeled the Leader Development Assessment Course. Cadets who take the APFT during training camp not a novice military population. They have been trained for at least a year, some for three years, and many have prior military experience in addition to their cadet training. They also come to summer camp knowing that their summer camp performance will have a major impact on their branch and service choices. Consequently, as a population they are experienced and motivated and the results of their tests show that they are physically more capable than any other Army population, with the possible exception of West Point (see the table below).

Table 1 A Comparison of APFT Performance

	Push-Ups	2-Mile Run	
Population	Mean Number	Mean Time (Minutes)	Source
ROTC Men 1992	69	13:03	Gregor, 1992
Army Men (17-21) 1988	53	14:43	Knapik, 1989

Army Men (22-26) 1988	53	14:49	Knapik, 1989
Basic Training Men 1989	45	14:31	DiBenedetto, 1989
ROTC Women 1992	42	15:46	Gregor, 1992
Fitness Company Men	29	15:18	DiBenedetto, 1989
Army Women (22-26)	31	17:43	Knapik, 1989
Army Women (17-21)	30	18:12	Knapik, 1989
Basic Training Women	22	17:24	DiBenedetto, 1989
Fitness Company Women	19	17:44	DiBenedetto, 1989

The APFT performance of ROTC cadets at summer camp provides a sound base upon which to assess the potential for physical training. The observations presented in this paper are made from analyzing the APFT scores from 1992 through 2008, 74,838 records. The results reveal the reasonable limits of any successful training program and the physical limits of the populations.

The ROTC cadet APFT records do not provide a basis for assessing the injury rates of the men and women. However, there are a considerable number of studies of initial entry training from which to assess the relative risk of injury. It is possible that a longer and more gradual period of physical training will reduce the incidence of IET training injuries. Recruits entering IET are not as fit or as strong as the population of ROTC cadets. However, there are a variety of studies relating aerobic fitness and body constitution to both recruit and active duty injury rates. Thus, the data about ROTC cadets can be used successfully to determine whether training can produce in the population of women the physical attributes that are required of men in the combat arms. The other study provides information with which to assess whether successfully trained women can survive the physical demands of close ground combat.

It is necessary to make one additional observation about the relevance of ROTC cadet physical performance data to IET. A new APFT scoring table was introduced in 1999. That table was developed by surveying the general army population and set the maximum score in each

APFT event at the 90th percentile of each age group. Thus, only 10 per cent of men, aged 17-21 in the army at large, are expected to achieve a 13:00 minute time on the 2-Mile Run; 10 per cent of the women in that age group are expected to attain 15:36. In contrast, 30 per cent of the cadet men and women bested those scores prior to 1999. The same is true of Push-Ups. About 76 per cent of the women and 80 per cent of the men exceeded the Army's established maximum score. Consequently, cadets tested after 1998 had less incentive to train to their full potential because the table scores for the events had been lowered. Cadet Command is accustomed to adjusting the relative importance of the APFT in the cadet's camp evaluation and it is extremely difficult to assess the effect those changes had on individual incentive. It is also likely that in the context of the wars in Iraq and Afghanistan cadets seeking active duty were keenly aware of the importance of physical fitness and worked to achieve their full potential. Whatever the impact of the scoring changes on individual incentive, the physical disparity between men and women remained great.

The data on ROTC cadet APFT performance have been collected over the course of 17 years, 1992-2009. The data set obtained from Army Cadet Command has rarely permitted linking height-weight data to individual performance on any event. However, the data provided in 2000 enabled analysis of the relationship between body constitution and aerobic capacity and that data is presented here. Additionally, much of the data was collected year by year and often in a format that differed from the previous year. In 2009, however, Cadet Command provided a decade of data, 1999-2008, in three separate EXCEL workbooks. The inferences drawn here are the product of analyzing 41,599 records from 1999-2008 and 33,239 records obtained previously, 74,838 records. Those records contain the population of men and women commissioned by the U.S. Army through ROTC throughout that period.

The charts below shows the distribution of cadet scores on the 2-Mile Run in 2000, the Push-Up, and the distribution of cadets by weight. The difference in performance is clear. Only 2.9 per cent of the women, 23, were able to attain the male mean score. The strength comparison

is somewhat worse, 1.5 per cent of the women achieved the male mean. Given the difference in stature between the cadet men and women, the difference in absolute strength is very large.

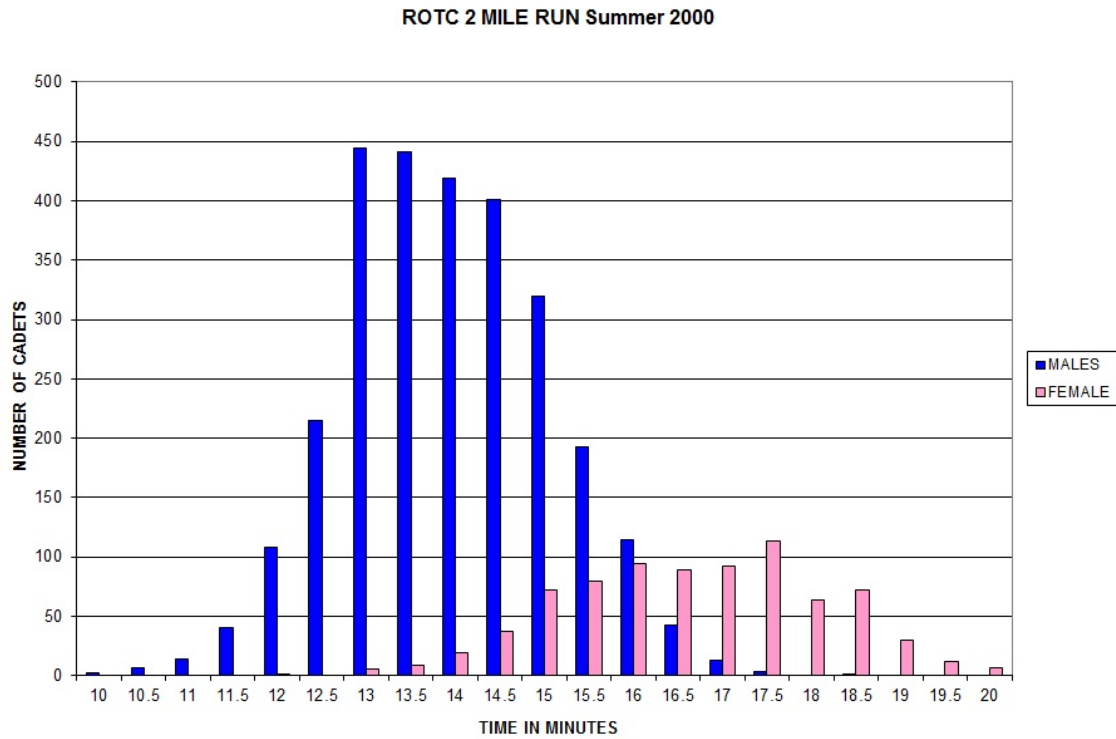


Figure 1 Cadet 2 Mile Run Results FY2000

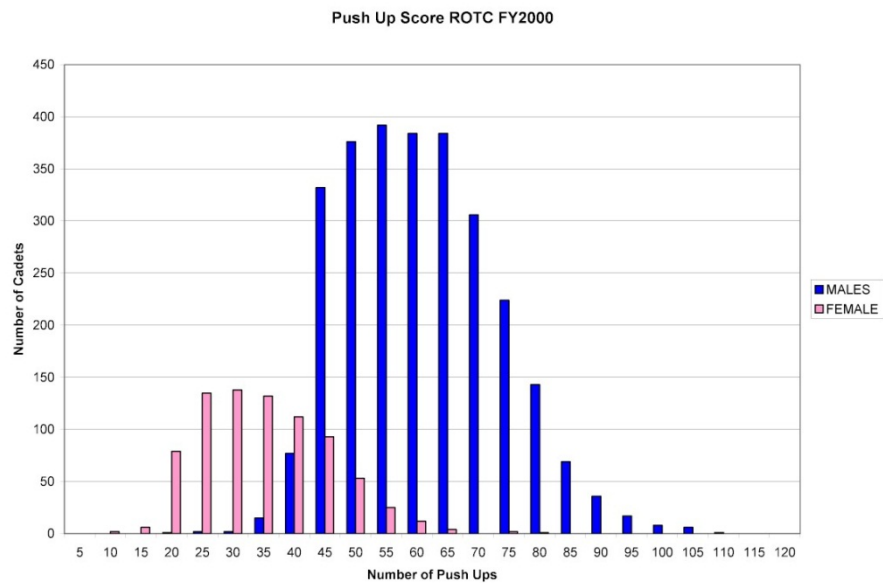


Figure 2 Cadet Push Up Results FY2000

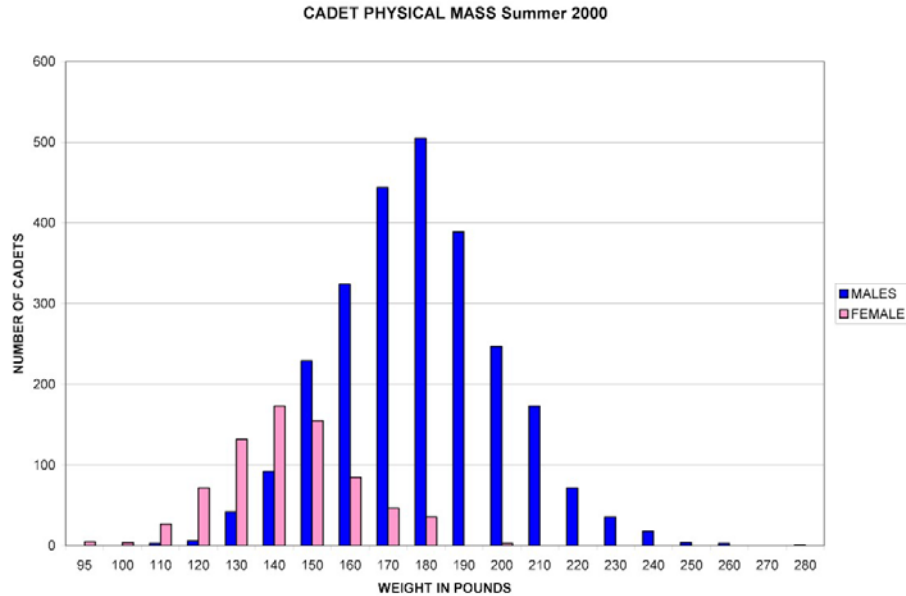


Figure 3 Cadet Mass FY2000

THE PERFORMANCE GAP

The performance gap represents a major obstacle to deriving benefit from common collective training. Consider the simple problem of different stature when it comes to setting the standard for load for training. A woman who is 5 feet 8 inches tall is in the 95th percentile of Army women in stature. Army Regulation 600-9 sets her allowable maximum weight at 150 pounds. The median stature of an Army male is 5 feet 9 inches; his allowable maximum weight is 175 pounds. FM 21-20, Physical Fitness Training suggests march training should begin with a load equal to 20 per cent of the body weight, in this case 30-35 pounds. (Thirty pounds was formerly the weight of a soldier's fighting load; the weight of his battledress uniform, helmet, load bearing equipment, protective mask, canteen, bayonet, and M16 rifle). Applying that standard, 95 per cent of the women to be trained will be over loaded. Now attempt to set the pace of the march given the differences in the level of conditioning. Immediately, the answer seems to be the same as that has been applied to IET physical fitness training: divide the unit into ability groups and set different loads for different populations. However, that is not what it means to train together and as the data from Army ROTC shows, as the men and women improve their

training needs will diverge even more. In contrast, keeping the men and women together can only diminish the training benefit received by men because the load or the march rate or both must be kept within the range of strength and endurance of the women.

The British experience training men and women together supports this conclusion. In 1998, the British Army introduced a job-related gender free selection process, Physical Selections Standards (Recruits) (PSS(R)). In 2002, Ian M.M. Gemmell published a study that observed that after introducing the (PSS(R)), the incidence of injuries among women during recruit training went up dramatically. Therefore, a study of gender differences in the physical demands of recruit training was undertaken. The study observed that male recruits in the mixed gender platoons experienced lower cardiovascular strain compared to their female counter parts.³⁴ However, cardiovascular strain is not only associated with injury but also with performance improvement. Training men with women reduced the benefit from the training. The chart below makes clear why this is the case for all men.

³⁴ Sam D. Blacker, David M. Wilkinson, and Mark P. Rayson, "Gender Differences in the Physical Demands of British Army Recruit Training," *Military Medicine*, 174 (2009), 816.

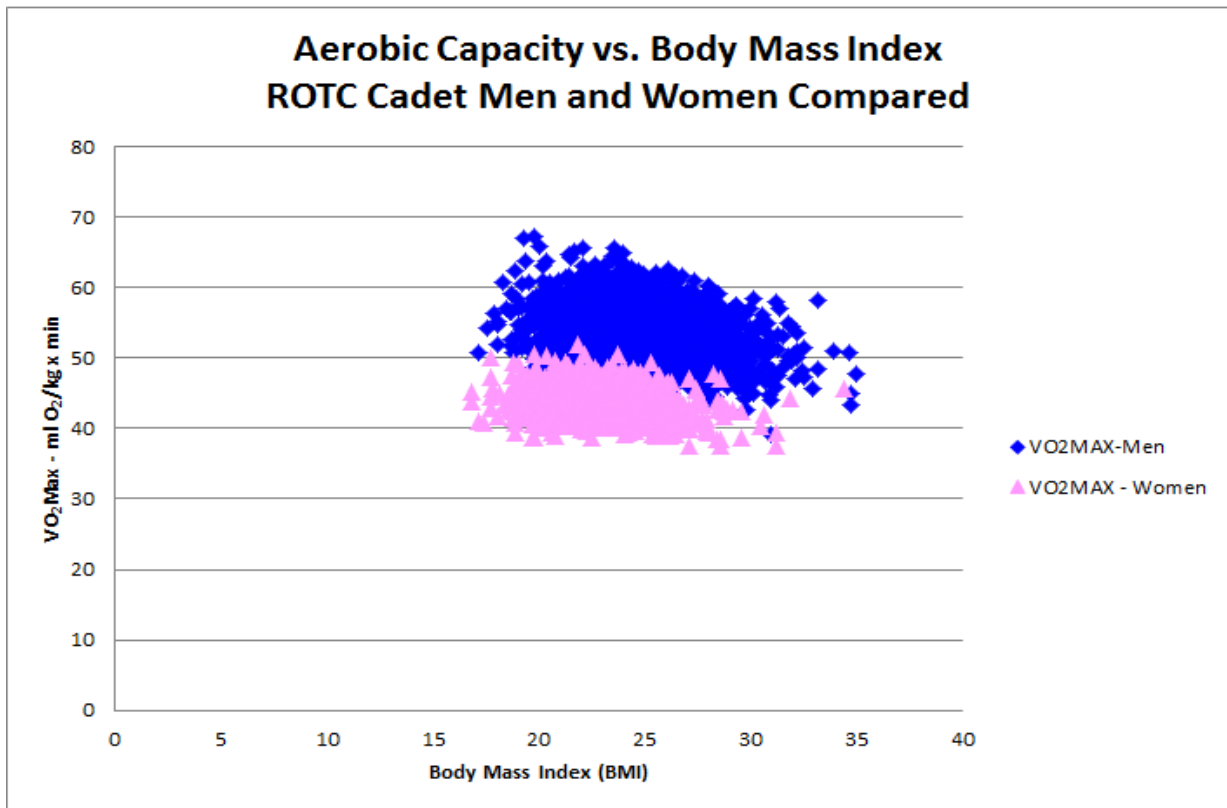


Figure 4 -Aerobic Capacity vs. BMI

If aerobic capacity correlates with body fat percentage and women were similar to men then it could be inferred that women with a lower body mass index would achieve greater aerobic efficiency and could be expected to compete with men. Figure 4 makes clear that that is not the case. Women at all body mass levels fail to achieve aerobic capacities that make them competitive with men. The chart indicates that the aerobic capacity achieved by women regardless of their body composition is less than the capacity of men. As the next chart will indicate there are a few, exceptional women who best the bottom 16% of men, but these rare women are four standard deviations above the female mean, fewer than 1 in a 1000. In this exceptionally fit ROTC Cadet population, considering 74,838 records, not one women achieved the male mean.

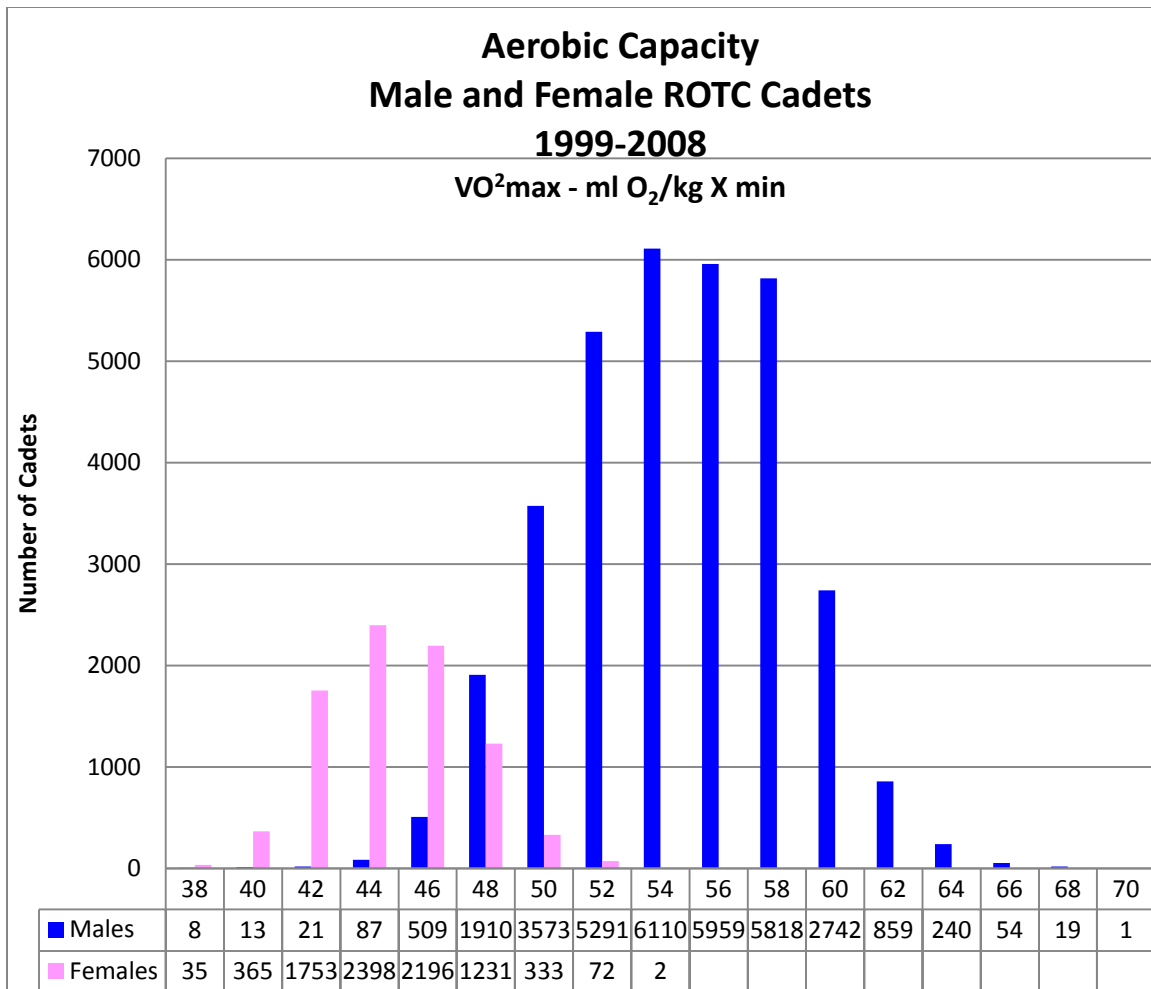


Figure 5: Aerobic Capacity 1999-2008

The average aerobic capacity for cadet males from 1999-2008 was 53.60 ml O₂/kg x min, the female mean was 43.75. The standard deviation for women was 2.5. Thus, the average male aerobic capacity was four standard deviations above the female mean. The best female achieved an aerobic efficiency of 53.1 ml O₂/kg x min, slightly less than the male mean. The standard deviation for men was 3.75, thus a VO₂max of 50 is one standard deviation below the mean. The histogram displayed in Figure 5 groups scores from the nominal number below, so the bar shown as 50 shows all those who scored above 48 up to and including 50. Thus, only 74 women, 74 of 8385 women, achieved an aerobic capacity higher than the lowest 15.8% of men. No training system can close this gap.

The reason men and women cannot truly be trained together is not a matter of attitude; it is physical. The difference in male and female body composition and the components of strength and endurance training are firm obstacles to designing mutually beneficial training events. Aerobic efficiency is related to the body's fat content. Strength is related to total fat-free body mass. Because women have a greater portion of their body composition in fat and do not add muscle mass as readily as men do, training men causes them to improve in absolute terms relative to women. The Natick study designed specifically to improve the load carriage ability of women lasted 24 weeks. At the conclusion of the study, the remaining 32 women had improved their box-weight lift capacity to 81 per cent of the Army male value. However, they added only .9 kilograms of muscle mass and achieved an average level of aerobic fitness below the minimum requirement for Army men.³⁵ The Army officially recognized that strength is related to total fat-free mass when in 1991, it increased the allowable body fat percentage for women from 28 to 30 percent to permit enlistment of larger, albeit aerobically less fit, women. The Army kept the allowable male percentage at 20.³⁶ Can it then follow that these new soldiers can be trained together? Does the evidence provide any support for including women in the ground combat arms, not really?

Numerous newspapers reported that the Natick study results demonstrated that woman could approach the strength of men. However, the more significant finding was that Army Basic Training did not prepare women for heavy lifting. The study recommended an experimental program during AIT to improve lifting capacity so that women might develop the capacity to serve in "very heavy" MOS's.³⁷ To graduate from the basic training men and women must attain

³⁵ U.S. Army Research Institute of Environmental Medicine. *Effects of a Specifically Designed Physical Conditioning Program on the Load Carriage and Lifting Performance of Female Soldiers*, By E. Harman, Peter Frykman, Christopher Palmer, Eric Lammi, Katy Reynolds, and Verne Backus. Technical Report no. T98-1 (Natick, Mass., November 1997) 48, 74

³⁶ HQDA Msg 2120002 August 1991, New Accession Weight and Body Fat Standards.

³⁷ E. Harman and others, 78.

50 points in each APFT event. This level of fitness presumably prepares women to enter very heavy occupational specialties as well as men. Yet, the difference between the gender-normed standards and actual performance is quite large. Fifty points on the APFT push-up event represents 32 push-ups for a man but only 13 for a woman. Thirteen push-ups is the IET entrance test requirement for men. If a man does fewer than 13, he is diverted from basic training to the Fitness Training Company to prepare for basic training. It is clear that now that many of the very heavy occupational specialties are open to women, some women have special training needs and basic training does not prepare them for “very heavy” MOS’s. The practice of mixed-gender basic training also does not prepare men fully. If women leave recruit training unprepared for the heavy occupational specialties to which they have been assigned, how is it possible for them to achieve the level of physical performance required by the ground combat arms? It is not.

In this regard, the British experience is insightful. Prior to 1998 female recruits in the British army were trained to a lower standard of physical fitness than men as is the case in U.S. Army IET today. The system was described as “gender-fair.” It was noted, however, that many of those female recruits were subsequently found to be physically incapable of performing the job to which they had been selected. Thus, in April 1998, the British Army introduced a standard set of physical test scores in relation to the career field. It was recognized the applying the “gender-free” standards would reduce the number of women in the more physically demanding career fields. Not only did the number of eligible women decline but also the injury and separation rate soared. The overuse injury rate among women rose from 4.6% to 11.1% while the rate among men was unchanged at 1.5%.³⁸ The study’s author, Ian M.M. Gemmell concluded that women face an excess risk when they undertake the same arduous training as male recruits and such

³⁸ Ian M M Gemmell, “Injuries among female army recruits: a conflict of legislation,” *Journal of the Royal Army Medical Corps* 148 (2002), 24.

training places concerns for health and safety in conflict with equal opportunity goals.³⁹ The British Army formally reviews its policy excluding women from ground combat positions every eight years. The last review was in 2010. The positions remain closed.

The medical literature and the physiological studies of marching, load bearing, and physically demanding military jobs makes clear that women are more prone to injury and separation in recruit training and in physically demanding duty positions. The rate of injury varies from study to study but greatly exceeds the male injury rate. It is not possible here to review all the reports. Many of these studies are listed in the bibliography. One study worth of note is systematic review of studies of stress fracture by Laurel Wentz, et. al.⁴⁰ That study compiles a variety of studies involving number of foreign militaries and athletic teams. The study reveals that women have a greater incidence of stress fracture and that women have anatomical disadvantages that increase the risk of stress fractures. The problem is not one of training.

Women are not only more prone to injury in training. They are also more likely to suffer non-battle injury during active military operations. In a study of disease and non-battle injuries in a brigade combat team (BCT) in Iraq the injury rate among women was twice that for men. The disease and non-battle casualty rate among the 325 women in the BCT was 408.6 per 1,000 Combat-Years versus 244 for men.⁴¹ Half of the women were evacuated for musculoskeletal injuries.⁴² Thus, it is fair to conclude that within ground combat positions the injury rate would be higher even if battle wounds were included.

³⁹ Ibid., 23.

⁴⁰ Laurel Wentz , MS, RD ; Pei-Yang Liu , PhD, RD ; Emily Haymes , PhD ; Jasminka Z. Ilich , PhD, RD, "Females Have a Greater Incidence of Stress Fractures Than Males in Both Military and Athletic Populations: A Systemic Review," *MILITARY MEDICINE*, 176, 4:420, 2011

⁴¹ LTC Philip J. Belmont Jr., MC USA; CPT Gens P. Goodman, MC USA; CPT Brian Waterman, MC USA; LTC Kent DeZee, MC USA; COL Rob Burks, QM USA; MAJ Brett D. Owens, MC USA, "Disease and Nonbattle Injuries Sustained by a U.S. Army Brigade Combat Team During Operation Iraqi Freedom," *MILITARY MEDICINE*, 175(2010), 471.

⁴² Ibid., 469.

MILITARY PERFORMANCE

Given the evidence presented thus far about strength, aerobic efficiency and injury what can be said about the physical performance of individual women in heavy physical occupations during the wars in Afghanistan and Iraq? The answer is, almost nothing, which might also be said about men in those units. Data on unit performance is not a surrogate for data on individual performance. The reason this is true should be obvious from the earlier discussion about sustaining performance during continuous operations. Military leaders will shift tasks not only to maintain individual performance but also to sustain organizational performance. They will not assign tasks to individuals who are unable to perform them, especially in the context of direct ground combat. This is true in all male combat units as well as combat and combat service support units. Assigning women to direct combat units differs from the current situation because the evidence indicates that women cannot be trained to achieve the average aerobic capacity of their male comrades and they do not have the stature to bear the heavy combat loads. An infantry squad leader would be foolish to assign the machine gun to a woman knowing that she would not only tire more quickly but also risk an incapacitating injury. Men in the formation attempting to lighten a woman's load would not be chivalrous; they would be responding to the need to preserve her capacity to participate in the unit's mission. Unfortunately, shifting her load to other squad members would serve to increase the load of the already burdened squad. The effect of task shifting on the overall performance and cohesion of the squad is a subject for another paper. How long a woman in an infantry squad might "ruck-up" and gut it out is a matter for speculation. The data presented in this paper supports the conclusion that whatever the performance of the squad of as a whole, the individual performance of women would be measured by the injury statistics.

REMEMBERING MILITARY READINESS

The discussion in this paper opened by noting that in 1981 when "Women, Combat, and the Draft" was published little was known about the physical requirements of the military

occupational specialties open to women and the ability of women to meet them. The history of the expanding role of women in the Army shows little concern for physical performance and individual combat readiness. The Army has officially argued that it does not know the relationship between performance on the Army Physical Fitness Test and job performance but it has invested much of its research in the APFT and its relationship to training success. The Army has, by its own admission, not developed job performance measures for the military occupational specialties open to both men and women and it does not screen recruits to determine that they possess the requisite strength for their chosen MOS. Yet, the Army's own research indicates that the vast majority of women do not possess the lean mass necessary to achieve the strength requirements for very heavy and heavy physical MOS's. Thus, by default the Army relies on IET and basic training in particular to produce the strength needed to enable training recruits in their MOS and has set "gender-fair" standards for the APFT, which until now have been the only official measurement of strength and aerobic capacity. Consequently, the Army does not know whether female IET graduates are physically ready to perform their duties, let alone ready for the rigors of direct ground combat.

The data presented here does not answer directly the question of whether women are suitable for ground combat positions. The data presented in this paper demonstrates that the Services, especially the Army, have expanded the occupational specialties open to women purely as a part of the social concern for equality and have only paid lip service to combat readiness. The data clearly reveals a very large gap between the physical strength, aerobic capacity and size of Army men and women. Training men and women correctly improves the performance of both groups but it also widens the gap in performance. It is unlikely a woman assigned to a heavy physical occupation possesses the required strength and endurance for those duties, regardless of her APFT score. That said, the data show that absent a gender-free assessment of physical requirements for an occupational specialty, training soldiers to meet actual job and combat requirements has been left up to the individual trainer or the soldier's supervisor. Those trainers

and supervisors, faced with observable differences in physical capacity, informally redistribute the tasks, in effect, establishing personal MOS requirements. What the Army does not admit but which the large body of ROTC data and Army research show, is that the Army could know precisely the training needs of women in the heavy and very heavy occupational specialties currently open to women. Even though assigning women to direct ground combat occupations is clearly infeasible, establishing occupational physical performance standards and testing the physical potential of incoming female recruits would greatly improve the selection of a suitable military occupational specialty.

In light of the evidence collected over the past thirty years concerning the physical performance of men and women in the military, the observations of the Military Leadership Diversity Commission seem bizarre. The commission observed that the discrepancy in the proportion of women among general officers was in part the result of low initial officer accessions and lower retention during the mid-career.⁴³ Establishing a gender-free training system to accommodate the assignment of women to ground combat occupations would reduce the number of women assessed and would increase mid-career attrition. Few if any women would be accessed into the ground combat arms and perhaps none would survive the twenty-five years before being considered for general officer. Yet, those who are committed to making the Army look right will never be swayed by evidence that putting women in the ground combat arms will not work right.

Thirty years ago, “Women, Combat, and the Draft” closed with the observation that the inclusion of women in the military had changed what the very idea of what a soldier was, that no

⁴³ Military Leadership Diversity Commission, *FROM REPRESENTATION TO INCLUSION: Diversity Leadership for the 21st Century Military*, Executive Summary (Arlington, VA: March 15, 2011), 11.

one yet knew the new definition, and that no one was willing to impose one.⁴⁴ The situation is no different today. Why can't anything be done?

⁴⁴ Gregor, 58.

BIBLIOGRAPHY

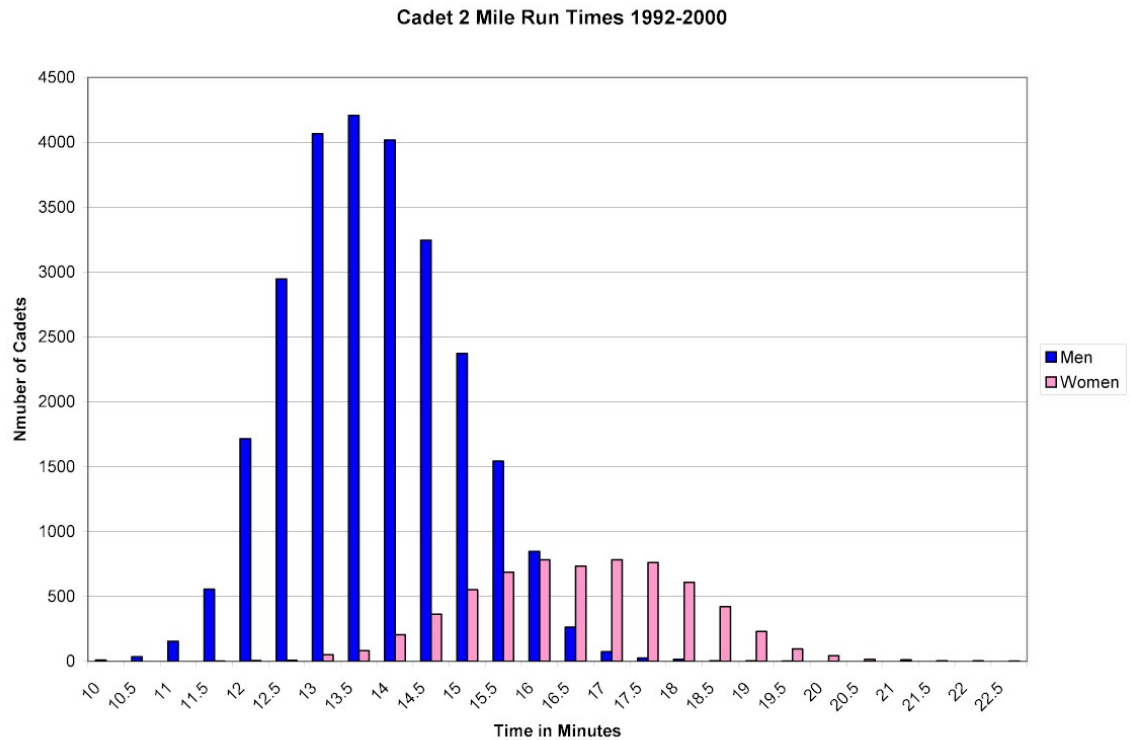
- Baldi, Karen A. "An Overview of Physical Fitness of Female Cadets at the Military Academies." *MILITARY MEDICINE* 156 (October 1991): 537-539.
- Belmont, Philip J., Jr., LTC MC USA; CPT Gens P. Goodman, MC USA; CPT Brian Waterman, MC USA; LTC Kent DeZee, MC USA; COL Rob Burks, QM USA; MAJ Brett D. Owens, MC USA. "Disease and Nonbattle Injuries Sustained by a U.S. Army Brigade Combat Team During Operation Iraqi Freedom." *MILITARY MEDICINE* 175, 7 (July 2010), 469-476.
- Bielenda, Christine C., Joseph Knapik, and David A Wright. "Physical Fitness and Cardiovascular Disease Risk Factors of Female Senior U.S. Military Officers and Federal Employees." *MILITARY MEDICINE* 158, 3 (March 1993): 177-181.
- Blacker, Sam D., David M. Wilkinson, and Mark P. Rayson. "Gender Differences in the Physical Demands of British Army Recruit Training." *MILITARY MEDICINE* 174, 8 (August 2009). 811-816.
- Buddin, Richard. "Weight Problems and Attrition of High Quality Military Recruits." RAND Note N-2847-FMP (June 1989).
- Carreiras, Helena and Gerhard Kuemmel, ed. *Women in the Military and in Armed Conflict. Wiesbaden, FRG: Verlag fuer Sozialwissenschaften*, 2008.
- Crawford, Kim, PhD; Katelyn Fleishman, MS; John P. Abt, PhD; Timothy C. Sell, PhD; Mita Lovalekar, PhD; Takashi Nagai, MS; Jennifer Deluzio, MS; LTC Russell S. Rowe, MD; LTC Mark A. McGrail, MD; Scott M. Lephart, PhD. "Less Body Fat Improves Physical and Physiological Performance in Army Soldiers." *MILITARY MEDICINE* 176, 1 (January 2011). 35-43.
- Department of the Army. FM 21-20 *PHYSICAL FITNESS TRAINING* (20 September 1992).
- Department of the Army. *WOMEN IN THE ARMY POLICY REVIEW*. Washington, D.C., 12 November 1982.
- DiBenedetto, Magarete. "Experience with a Pre-Basic Company at Fort Jackson." *MILITARY MEDICINE* 154 (May 1989): 259-263.
- Febbraro, Angela R. *Women, leadership and gender integration in the Canadian combat arms: A qualitative study*. Toronto: Defense R&D Canada, December 2003.
- Foulkes, Guy D. "Orthopedic Casualties in an Activated National Guard Mechanized Infantry Brigade during Operation Desert Shield." *MILITARY MEDICINE* 160 (March 1995): 128-131.
- Friedl, Karl E., Jennifer A. Nuovo, Tray H. Patience, and Joseph R. Dettori. "Factors Associated with Stress Fracture in Young Army Women: Indications for Further Research." *MILITARY MEDICINE* 157, 7 (July 1992): 334-338.
- Gebicke, Mark E. GAO, "Military Attrition: DOD Needs to Better Analyze Reasons for Separation and Improve Recruiting Systems," Testimony Before the Subcommittee on Military Personnel, Committee on National Security, House of Representatives, March 12, 1998.
- Gemmell, Ian M. M. "Injuries among female army recruits: a conflict of legislation" *Journal of the Royal Army Medical Corps* 148 (2002), 23-27.

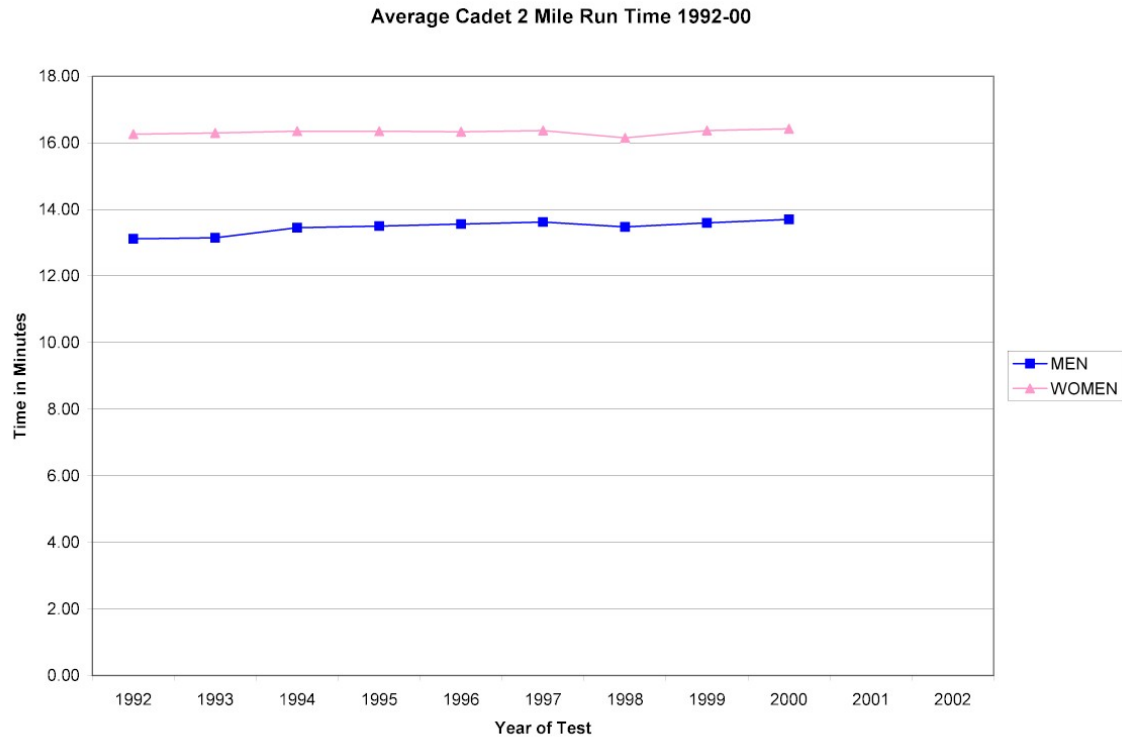
- Goldberg, Matthew S. "Death and Injury Rates of U.S. Military Personnel in Iraq." *MILITARY MEDICINE* 175, 4 (April 2010). 220-226.
- Gordon, Claire C., Thomas Churchill, Charles E. Clauser, Bruce Bradtmiller, John T. McConville, Ilse Tebbetts, and Robert A Walker. *1988 Anthropometric Survey of U.S. Army Personnel: Summary Statistics Interim Report*. U.S. Army Research Institute of Environmental Medicine (March 1989) Technical Report TR89/027.
- Gregor, William J. "Women, Combat and the Draft: Placing Details in Context." in Taylor, William J., Jr. and Schrader, Richard A. ed. *Defense Manpower Planning: Issues for the 1980's* (Elmsford, NY: Pergamon Press, Inc., 1981).
- Harman, E., Peter Frykman, Christopher Palmer, Eric Lammi, Katy Reynolds, and Verne Backus. *Effects of a Specifically Designed Physical Conditioning Program on the Load Carriage and Lifting Performance of Female Soldiers*. U.S. Army Research Institute of Environmental Medicine (November 1997) Technical Report T98-1.
- Headquarters, Department of the Army. Army Regulation 600-9 *The Army Weight Control Program*, (Washington, D.C., 1 September 1986).
- Headquarters, Department of the Army. Interim Change No. 101 to *The Army Weight Control Program*, Army Regulation 600-9. 15 November 1993.
- Hollander, Ilyssa E. MPH and Nicole S. Bell, SeD, MPH. "Physically Demanding Jobs and Occupational Injury and Disability in the U.S. Army." *MILITARY MEDICINE* 175, 6 (October 2010). 705-712.
- Knapik, Joseph and Kay Reynolds. *Load Carriage in Military Operations: A Review of Historical, Physiological, Biomechanical, and Medical Aspects* (Washington, DC: Borden Institute, 2010).
- Knapik, Joseph. "The Army Physical Fitness Test (APFT): A Review of the Literature." *MILITARY MEDICINE* 154 (June 1989): 326-333.
- . "Discharges during U.S. Army Basic Training: Injury Rates and Risk Factors." *MILITARY MEDICINE* 166, 7 (July 2001). 641-647.
- Lester, Mark E., CPT; Joseph J. Knapik; SGT Daniel Catrambone; Amanda Antczak; Marilyn A. Sharp; MAJ Lolita Burrell; Salima Darakjy. "Effect of a 13-Month Deployment to Iraq on Physical Fitness and Body Composition." *MILITARY MEDICINE* 175,6 (June 2010). 417-423.
- Military Leadership Diversity Commission. *FROM REPRESENTATION TO INCLUSION: Diversity Leadership for the 21st Century Military*. Executive Summary, Arlington, VA: March 15, 2011.
- Military Leadership Diversity Commission. *FROM REPRESENTATION TO INCLUSION: Diversity Leadership for the 21st Century Military*. Arlington, VA: March 15, 2011.
- Ministry of Defense, United Kingdom. *REPORT ON THE REVIEW OF THE EXCLUSION OF WOMEN FROM GROUND CLOSE-COMBAT ROLES* (November 2010).
- O'Conner, John S., Michael S. Bahrke, and Robert G. Tetu. "1988 Active Army Physical Fitness Survey." *MILITARY MEDICINE* 155 (December 1990): 579-584.
- Patterson, Harlan S., Thomas W. Woolley, and Wayne M. Lednar. "Foot Blister Risk Factors in an ROTC Summer Camp Population." *MILITARY MEDICINE* 159 (February 1994): 130-135.

- Protzman, Robert R. "Physiologic Performance of Women Compared to Men: Observations of Cadets at the United States Military Academy." *The Journal of American Sports Medicine* 7 no.3 (1979): 191-194.
- Reinker, Kent A. and Susan Ozburne, "A Comparison of Male and Female Orthopaedic Pathology in Basic Training." *MILITARY MEDICINE* 144 (August 1979): 532-536.
- Reynolds, Katy, COL, MC USA (Ret.); Ludmila Cosio-Lima, PhD; LTC Maria Bovill, SP USA; William Tharion, MS; Jeff Williams, BS; Tabitha Hodges, MS. "A Comparison of Injuries, Limited-Duty Days, and Injury Risk Factors in Infantry, Artillery, Construction Engineers, and Special Forces Soldiers." *MILITARY MEDICINE* 174, 7 (July 2009). 702-708.
- Ross, James. "A Review of Lower Limb Overuse Injuries during Basic Training. Part 1: Types of Overuse Injuries." *MILITARY MEDICINE* 158 (June 1993): 410-415.
- Simpson, Michael B., Christopher Young, and Allan L. Burkett. "The Incidence of Permanent Upper and Lower Extremity Profiles in Active Duty Army Officers." *MILITARY MEDICINE* 157 (January 1992): 17-21.
- Snoddy, Robert O'Neil, Jr. and John M. Henderson. "Predictors of Basic Infantry Training Success." *MILITARY MEDICINE* 159 (September 1994): 616-622.
- The Presidential Commission on the Assignment of Women in the Armed Forces*, by GEN Robert T. Herres, Ret., Chairman. Washington, D.C., November 15, 1992.
- Tomasi, Louis F. "The New 1998 APFT Standards." *SOLDIERS* (February 1998): 5-8.
- Vogel, James A. "Obesity and Its Relationship to Physical Fitness in the Military." *Armed Forces and Society* 18 (Summer 1992): 497-513.
- US Army Research Institute for the Behavioral and Social Sciences *The 1995 Gender Integration of Basic Combat Training Study*. By Jacqueline A. Mottern, David A. Foster, and Elizabeth J. Brady. Study Report No. 97-01 (February 1997)
- U.S. Army Research Institute of Environmental Medicine. *Effects of a Specifically Designed Physical Conditioning Program on the Load Carriage and Lifting Performance of Female Soldiers*, By E. Harman, Peter Frykman, Christopher Palmer, Eric Lammi, Katy Reynolds, and Verne Backus. Technical Report no. T98-1, Natick, Mass., November 1997.
- Wentz, Laurel, MS, RD; Pei-Yang Liu, PhD, RD; Emily Haymes, PhD; Jasminka Z. Ilich, PhD, RD. "Females Have a Greater Incidence of Stress Fractures Than Males in Both Military and Athletic Populations: A Systemic Review." *MILITARY MEDICINE*, 176, (2011) 4:420,

APPENDIX A: Trends in ROTC APFT Performance 1992-2000

The long term data collected is consistent with the data presented on the Army ROTC Cadet APFT performance for FY2000. Throughout the period 1992-2000, the average male cadet remained 2 minutes faster than his average female counterpart. The drop in male times beginning in 1994 might have been caused by the Army's decision to reduce the importance of the APFT score in both the ROTC summer camp evaluations and in the accession process. The dip in 1998 occurred before the new APFT standards went into effect. However, the failure to recover from the dip may reflect the fact that the 1998 APFT tables tended to inflate cadet APFT scores generally.





The table below displays the average results for men and women over the period.

Table 2 APFT Average Results 1992-2000

PUSH UP Number	1992	1993	1994	1995	1996	1997	1998	1999	2000
MEN	69.10	66.64	65.52	65.08	60.88	60.56	57.01	58.39	58.88
WOMEN	41.66	42.41	38.91	43.50	36.20	35.22	44.31	33.03	32.89
2 Mile Run Time in Min.	1992	1993	1994	1995	1996	1997	1998	1999	2000
MEN	13.12	13.15	13.45	13.50	13.56	13.62	13.47	13.59	13.70
WOMEN	16.26	16.30	16.35	16.35	16.33	16.37	16.15	16.37	16.42
VO ₂ max ml O ₂ /kg x min	1992	1993	1994	1995	1996	1997	1998	1999	2000
MEN	55.76	55.65	54.63	54.47	54.27	54.08	54.56	54.16	53.80
WOMEN	44.12	44.05	43.83	43.72	43.99	43.93	33.86	43.92	43.83

APPENDIX B: Discussion of Impact of New 1998 APFT Standards on Cadet APFT Scores (Presented to Cadet Command June 1998)

12 June 1998

INFORMATION PAPER

SUBJECT: Effect of Implementing the 1998 AFPT Standard on ROTC Cadet APFT Scores

Prepared by: Dr. William J. Gregor
School of Advanced Military Studies Fort Leavenworth, KS 66048

1. **Purpose.** To determine what changes in male and female cadet APFT scores can be expected to occur when the 1998 APFT Score Chart is implemented.
2. **Method.** The Army ROTC Advanced Camp APFT results for 1997 were reevaluated by converging the cadet raw scores using the 1998 APFT Score Chart and comparing the scores achieved for each event with those obtained using the DA Form 705, May 1987 AFPT scorecard.
3. **Background.** The 1998 APFT Score Chart is the result of a survey of soldier fitness done by the Army Physical Fitness School at Fort Benning, Georgia. The changes in the APFT Scoring System are intended to set standards that accurately reflect performance expectations. Although in most cases the raw score required to MAX. each event on the 1998 APFT Score Chart is lower than required on the previous scoring card, the fitness data obtained by the survey showed that very few, if any soldiers achieved the maximum score set in 1987. Using statistical techniques, the new maximum score is set at the 90th percentile, while the new minimum is set at the 8th percentile; meaning that only 10 per cent of the soldiers are expected to max. the test, and only 8 percent should fail. These are the expected results for the entire army and not the results that will be achieved by a smaller, better trained, subgrouping. ROTC cadets are a special population within the Army and cadets are physically more fit.

4. Results.

a. General. Because the 1998 APFT Score Chart has been normed to match the performance of men and women in eight age groups, it is impossible to render a conclusion that is true for all cadets. Most cadets who attended the 1997 ROTC Advanced Camp were in the first three age groups: 17-21, 22-26, and 27-31. There were, however, a small number of cadets who inexplicably had birth dates that placed them in the 32-36 age group. Among cadets the APFT scores of men and women aged 17-21 dramatically improved, scores of those aged 22-26 improved slightly, and cadets scores in the 27-31 age group fell slightly. Because the majority of cadets at summer camp are in the first two age groups and because cadets are physically more fit than the Army as a whole, the 1998 APFT Score Chart when implemented will dramatically increase the number of cadets who achieve a 270 or higher on the APFT. Because the 1998 APFT standards will bunch cadets toward the top of the scoring table the APFT will not be a useful discriminator (Enclosure 1). Likewise inflation in the scores of female cadets gives the impression that women are performing better in comparison to men while the gap between actual male and female performance remains unchanged.

b. APFT Scores. The men and women in the 17-21 age group will have their scores raised significantly when the 1998 APFT Score Chart is used. The tables below show the shift.

APFT -- MAX. SCORE 300

<i>Cadet Men</i>	<i>% Max. 87</i>	<i>% Max. 98</i>	<i>% Above 270 87</i>	<i>% Above 270 98</i>
	<i>Std</i>	<i>Std</i>	<i>Std</i>	<i>Std</i>
Age 17-21	1.1	10.0	20.7	48.2
Age 22-26	2.9	6.8	28.0	40.2
Age 27-31	4.7	4.7	36.1	35.7

APFT

<i>Cadet Women</i>	<i>% Max. 87</i>	<i>% Max. 98</i>	<i>% Above 270 87</i>	<i>% Above 270 98</i>
	<i>Std</i>	<i>Std</i>	<i>Std</i>	<i>Std</i>
Age 17-21	2.3	13.3	23.9	46.3
Age 22-26	1.1	4.9	25.6	38.3
Age 27-31	0.0	0.0	43.4	34.0

c. 2 MILE RUN. The change in the 2 Mile Run score chart is the change that effects the overall APFT the most. The requirements have been lowered for the lowest two age groups, with the 17-21 year old group profiting the most by the change. The single exception is women over 27 years old and older. The new standard is significantly harder than that on the 87 Score Card. As the “% Above 90” column indicates, older men are relatively better off than older women.

2 MILE RUN -- MAX. SCORE 100

<i>Cadet Men</i>	<i>% Max. 87 Std</i>	<i>% Max. 98 Std</i>	<i>% Above 90 87 Std</i>	<i>% Above 90 98 Std</i>
Age 17-21	9.3	37.0	34.1	59.8
Age 22-26	19.0	29.0	45.3	54.2
Age 27-31	32.7	33.1	64.5	61.5

2 MILE RUN

<i>Cadet Women</i>	<i>% Max. 87 Std</i>	<i>% Max. 98 Std</i>	<i>% Above 90 87 Std</i>	<i>% Above 90 98 Std</i>
Age 17-21	22.6	36.7	41.9	51.7
Age 22-26	26.3	26.7	48.1	48.1
Age 27-31	49.1	17.0	73.6	47.2

d. PUSH UPS. The change in the Push Up score chart is similar to the change in the 2 Mile Run. The requirements have been lowered for the lowest two age groups, with the 17-21 year old group profiting the most by the change. However, unlike the effect on the 2 Mile Run score chart, women over 27 years old profit from the change. The new standard does not benefit men over 27. As the % Above 90 column indicates, women are relatively better off than men.

PUSH UPS -- MAX. SCORE 100

<i>Cadet Men</i>	<i>% Max. 87 Std</i>	<i>% Max. 98 Std</i>	<i>% Above 90 87 Std</i>	<i>% Above 90 98 Std</i>
Age 17-21	7.6	22.8	21.1	39.0
Age 22-26	9.9	16.3	25.5	33.4
Age 27-31	10.4	10.8	28.0	28.0

PUSH UPS

<i>Cadet Women</i>	<i>% Max. 87 Std</i>	<i>% Max. 98 Std</i>	<i>% Above 90 87 Std</i>	<i>% Above 90 98 Std</i>
Age 17-21	4.4	31.1	16.8	47.3
Age 22-26	4.5	16.5	16.5	32.0
Age 27-31	7.5	11.3	28.3	30.2

e. SIT-UPS: The only significant change in the score chart for push ups was the decision to use a single table for both men and women. However, this change produced little significant effect because the scores of cadet women were already high in comparison with women in the Army as a whole. The 1998 Score Chart raised the minimum number of push ups slightly. This caused a few women and men who stopped at the minimum number of sit ups to score below the passing score of 60, but this is not likely to have been a result of muscle failure. Cadet populations should have no trouble passing the sit up event.

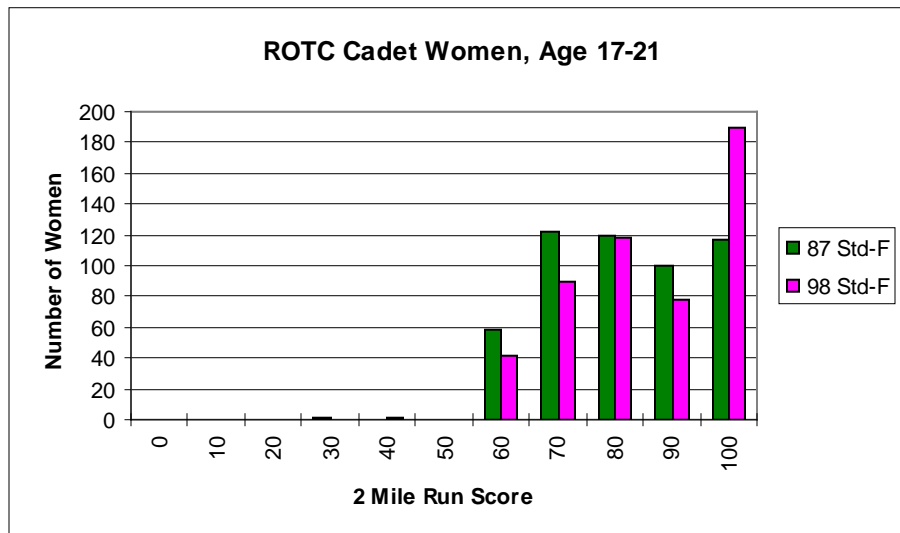
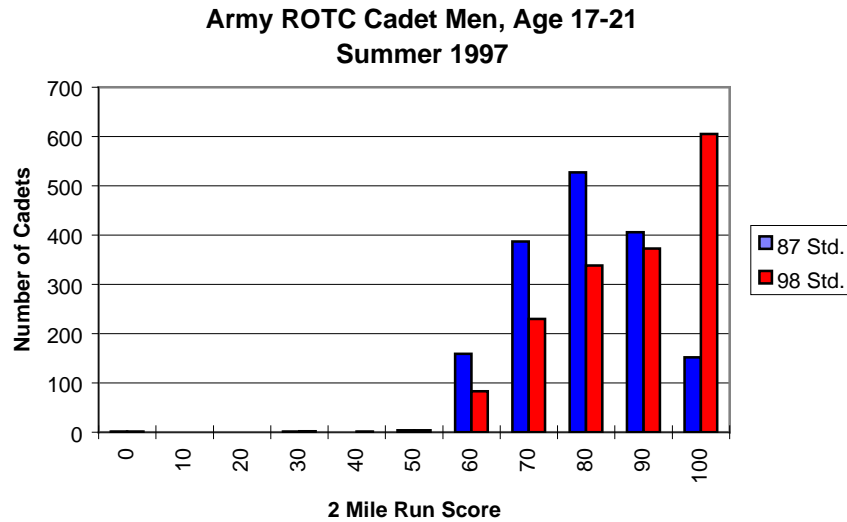
5. Comment. From a training standpoint lowering the standard for the younger cadets presents two problems. First, it is unlikely that during the first year of implementation there will be any decline in cadet performance because those cadets will have been evaluated and trained using the 1987 standard. However, future year groups will no longer strive for those higher scores and may not achieve as high a level of fitness as previous year groups. For example, the 2 Mile Run

standard of 11:54 for males aged 17-21 caused cadets to exercise very hard to obtain 100 points. The new standard of 13:00 will not require as much effort and many may not strive to achieve any higher level of fitness. Thus, overall cadet fitness may remain good but will not approach the cadet potential. Second, because cadets compete with each other for commissions and active duty, older cadets who are required to do more push-ups and sit-ups than their younger classmates may perceive a disadvantage in on campus grading. To the extent that APFT scores are a factor in the cadet OML, RECONDO badges, or Fitness Awards this anomaly may prove to be a cadet irritant.

6. Recommendation. Cadet Command ought to consider implementation of a cadet APFT standard that reflects cadet physical fitness potential but retains the commissioning minimums for each age group. Such a table would provide cadets a better incentive to improve physically while permitting a reasonable assessment of cadet performance for evaluation purposes. As currently set the 1998 AFPT Score Card is not a good tool for assessing or encouraging cadet performance. From a cadet evaluation perspective, the sole purpose of the 1998 APFT Score Chart is to determine whether the MSIV cadet has achieved minimum commissioning standards.

ENCLOSURE 1

Skewing of APFT Event Scores.



The two charts above illustrate the effect of the 1998 APFT Score Chart on the cadet 2 Mile Run scores. The proportion of men and women achieving the maximum score and scores over 90 on the event increases dramatically.